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ABSTRACT

This paper discusses advances in technology and how teachers can use technology for teaching students with disabilities. The work of the Macomb Projects, a group of federally funded, early childhood special education projects at Western Illinois University that has been exploring the use of computer and adaptive technologies in the education of young children with disabilities, is described. Highlighted are: the benefits of assistive technology to children with physical disabilities (encourages autonomous behavior and the increases the probability of interaction with the environment); verbal and nonverbal children (computers encourage communication); and children with autism (computers encourage socialization) are highlighted. Components of implementing technology are also discussed, including the need for administrative support and staff development, technology integration, and software evaluation. Characteristics of good software for young children with special needs are identified, including materials that: (1) encourage exploration, use of imagination, and problem solving; (2) contain sound, music, and voice; and (3) are open ended, animated, and interactive. Other good software characteristics are: the menu and interface facilitate independent use; children can determine the order in which the activities are to be played; several levels of difficulty can be selected; novelty is built-in; the program is highly responsive; and animated routines and verbal instructions are interruptible. (Contains 17 references.) (CR)

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Technology in Education: A Case for Change

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Technology in Education: A Case for Change

Are you old enough to have met George Jetson before the cartoons about him and his family were re-runs on Nickelodeon? If so, you probably remember watching the series' unusual technologies—the food cooking itself on command, the instantaneous communication, the computer-assisted homework, the rapid transportation—and thinking, "Wow, wouldn't that be great! Too bad it'll never happen."

Guess what? It has happened. It is happening! Our world is filled with amazing technologies that our children take for granted and that tend to bewilder those of us old enough to remember the day our family bought its first TV set! VCRs, compact disc players, computers, modems, fax machines, cellular phones, microwave ovens, photocopy machines, bar code scanners, digital cameras—even the remote controls that allow us to become "couch potatoes"—all are wondrous technologies that allow us to do things better, faster, easier. Where will it lead? What are the possible impacts on and for education? The potential is mind-boggling.

Teaching and Learning with Technology

Technology As A Tool for Teachers

Teachers have always used tools to help them present the material to be learned. Some of these tools we classify today as "low tech"—such things as chalk and chalkboards, magic markers and poster paper; others by comparison have been more "high tech"—tape recorders, 8 mm movie projectors, film strip projectors, slide projectors, overhead projectors, opaque projectors, VCRs, followed by laser disc players. Such technologies were—and often still are—excellent tools for presenting material, yet one common characteristic of each was that the students were required to be passive, to sit back and watch the pictures or movie and listen to the lectures. Except for the few students who listened attentively or raised their hands to ask questions, very little interaction took place or was required.

Today's newest "high tech" educational tools include computers and interactive software. From a teaching perspective, they offer many advantages ranging from classroom management, recordkeeping, assessment, lesson planning, and lesson presentation. Computer software exists that enables a teacher to accomplish all these tasks and more in less time than traditional methods. The time saving features of databases, spreadsheets, desk top publishing, and word processing software allow teachers to organize their lessons, their classroom budgets, their communication with parents, and children's IEPs, assessment portfolios, and personal records. Once created and stored on hard drive or floppy disk, the files containing these materials are accessible and available for modifying and updating. Calendar making programs, graphics programs, and such programs as *Print Shop Deluxe* provide teachers with tools for creating posters, classroom calendars (weekly, monthly, yearly), banners, invitations, name tags, and labels. Using fast and easy authoring software, such as Roger Wagner's *HyperStudio,* teachers can even create their own software that enhances a curricular activity or is individualized for a particular student.

Technology plays an especially essential role for teachers of children with disabilities. Not only does it make some of the routine teaching tasks easier, but also it allows the teacher to create learning activities and set up inclusive learning environments that enable the child with disabilities to learn and play along with the other children. In addition, special education teachers can take advantage of the plethora of information about disabilities and assistive technology that is posted on various web sites. Resources, chat rooms, and articles can be accessed to provide current, important information to any teacher, no matter how remote or rural her classroom is. Contact can be made with consultants, well-known professionals, and other early childhood colleagues through e-mail for sharing curriculum ideas and gaining resource information. The potential for future uses grows daily as new technologies are created and as inventive teachers realize the power computers have as teaching tools and begin to take advantage of their capabilities.

Technology As A Tool for Young Children with Disabilities

Since 1980, Macomb Projects, a group of federally-funded early childhood special education projects at Western Illinois University, has been exploring the potential of computer and

adaptive technologies as they relate to the education of young children with disabilities. The overriding mission of Macomb Projects is to provide equalizing opportunities to young children with disabilities by providing their families and teachers with training, technical assistance, and products relating to assistive technology. Technology, particularly computers and adaptive peripherals, has provided these young children, their families, and their teachers with tools for equalizing opportunities in many areas—cognitive development, motor development, social development, and self esteem, to name a few.

Computers are extremely patient and not critical when children make mistakes, marvelous characteristics which make them quite effective for young children's learning. Not only that, the newer interactive software allows young children to explore and experiment in a safe environment where there is no wrong answer and where a child may experience success, sometimes for the first time.

Computers are an especially important learning tool for children with physical disabilities. Assistive technologies, including computers and adaptive devices (e.g., switches, alternative keyboards, PowerPads, TouchWindows) provide children with disabilities a variety of tools that encourage autonomous behavior and increase the probability that they will interact with their environment (Hutinger, 1996). For example, a child who is unable to hold a pencil can use the computer, a switch or TouchWindow, and a graphics program to draw. Parents and teachers involved in Macomb Projects' longitudinal research study on technology's effectiveness for children with multiple disabilities reported that their children showed greatest gains in areas of social and emotional behaviors, "including enhanced self concept, independence, social interaction, cooperation, and exploratory play." (Hutinger, Johanson, Stoneburner, 1996, p. 26-27) Gains in cognitive, motor, and communication development also resulted from assistive technology use.

Both verbal and nonverbal children can use the computer as a communication tool. Software provides both subjects and purpose for conversations for those who are able, and willing, to speak. Social interactions among children using the computer occur spontaneously and should be encouraged. Children for whom verbal communication and/or social interaction is

difficult are motivated to increase skill in these areas through their interactions with the computer. Michael, an autistic child in one of Macomb Projects' research classrooms provides an excellent example of the power of technology. When the school year began, 4 year old Michael was nonsocial. Not only that, he was a screamer. Anyone's touch set him off. One day when he was using *Just Grandma and Me,* he saw Little Critter give Grandma a hug. "Hug," said Michael. "Do you want to give me a hug," asked his teacher. "No," said Michael, "hug Ronny" (his personal aide). Then he got up from the computer and gave Ronny a hug! After that, other children and adults were able to touch Michael without him screaming. Even better, he loves the computer and socializes there with his classmates. At the computer, they talk about the story, problem solve, give directions, and take turns. Socializing at the computer affected Michael's behavior away from the computer also. By the end of the school year, he had appointed himself Official Classroom Greeter and made sure he was at the door to tell each child "hello" every morning.

Implementing Technology

Undeniably, the role of technology in early childhood special education is that of a tool for learning, communicating, equalizing opportunities, and creating positive changes in the learning environment (Sivin-Kachala & Bialo, 1996). Technology appears to hold great potential for learning for all ages, and research has shown that technology can have especially great impact on the learning of children with disabilities (Bialo & Sivin, 1990; Cohen, 1993; Holder-Brown & Parette, 1992; Hutinger, et.al, 1994; Hutinger, Robinson, & Johanson, 1990; McCormick, 1987; Sartorio, 1993; Sivin-Kachala & Bialo, 1996).

The potential technology has for *all children* is beyond anything in past educational experiences. But in and of itself technology is no magic wand. To be effective, it must be used—and used appropriately. Simply having a computer and adaptive technologies available for the children is not enough.

Administrative Support and Staff Development

The classroom teacher and her program assistants hold the key to successful integration of technology into the special education classroom because they control its use and create

opportunities for children to use the technology as a tool. Therefore, technology training is critical. Without training, without the opportunities to learn to use the equipment for themselves, teachers may have difficulty being motivated or comfortable using the technology in their classroom environment.

Administrative support for technology training is essential. Findings from Macomb Projects' Technology Inservice Project (Project TIP) indicated that technology training tends to be most successful when teachers and administrators plan together. Project TIP staff found that whether the initial idea to host a TIP workshop was a teacher's idea or an administrator's idea, if there was collaboration, the results were good. When either group tried the workshop without support and input from the other, events often did not go smoothly. If administrators scheduled a workshop without teacher "buy-in," teachers would attend as expected, put in their time, and go about business as usual when the workshop ended. If teachers organized a technology workshop without administrative support, the workshop itself was successful but, since there was no administrative support and follow through, teachers' initial excitement about implementing technology turned to frustration due to the administrator's lack of enthusiasm and support (Hutinger, 1995).

Teachers have a tendency to continue using traditional materials and strategies, in effect to teach the way they were taught (Means & Olson, 1994). Dwyer (1994) points out that effective technology integration means teachers must change teaching strategies and move from teacher-centered activities to those that are learner centered; that they must become facilitators and collaborators; and that instruction must move from memorization to problem solving.

Change is seldom easy, but teachers who receive more than just "one-shot" technology training workshops, those who receive appropriate training at their own developmental level and who also are provided with opportunities for follow-up training and support, those who use technology as a tool for themselves, are the teachers who are most likely to see technology's benefits for learning and to implement technology effectively into their classroom curriculum. For such teachers, change is neither a headache nor a chore, but a natural and welcome evolution.

Technology Integration

Effective technology implementation in the preschool special education classroom—or in any classroom—involves a knowledgeable teacher who understands technology's potential for education. The teacher's role involves arranging the classroom environment (both the physical environment and the learning environment) to give children access to the technology. In addition, the teacher must plan developmentally appropriate activities that are available to the children throughout the day. Computer software can be used to introduce a concept or to reinforce a concept that has been introduced through more traditional methods. The effective teacher drops the "expert" role and becomes a facilitator to the children's learning by setting up an appropriate environment and designing curriculum activities that reinforce key concepts both on and off the computer.

Ideally, classrooms have a computer center in addition to the traditional block center, writing center, art center, housekeeping center, and so on. Children are able to select computer as an activity during free choice time. They may work individually or gather around the computer in small groups. The teachers also use the computer with both large and small groups, depending on the activity. Children with physical disabilities or language impairments have access to their assistive technology throughout the day.

Over the years that Macomb Projects has been involved with young children, teachers, and assistive technology, we have witnessed many teacher practices that negatively impact successful integration. These include using computers for drill and practice, allowing only one child to sit at the computer at a time, limiting children's turns on the computer to no more than 5 minutes, and using the computer as a reward. Teachers using these practices typically do so because they haven't been exposed to alternatives. They've simply made gut-reaction decisions about technology use in their classrooms. For instance, one classroom teacher took a child's augmentative communication away from her and put it on a shelf after morning circle time. In her mind, she was protecting the expensive equipment from damage it might receive during the school day. What she did not consider was that she was depriving the child of communication except for a short time each morning (Hutinger, et. al, 1994; Hutinger, Johanson, Stoneburner, 1996).

Software Evaluation

Software for early learning abounds and, given limited financial resources, teachers must decide which software will be most appropriate for their classroom needs. According to Pierce (1994), good software for young children does the following:

- encourages exploration and imagination;
- encourages problem solving;
- contains sound, music, and voice;
- is open ended, animated, interactive.

In addition to these features, *Children's Software Revue*(1996) recommended the following characteristics, especially targeting children with special needs:

- The menu and interface facilitate independent use.
- Children can determine the order in which the activities can be played.
- Several levels of difficulty can be selected.
- Novelty is built-in.
- The program is highly responsive.
- Animated routines and verbal instructions are interruptible.

Creative Uses of Technology

In our projects' classrooms we have witnessed many creative curriculum integration ideas based on children's software. For example, in one preschool special education classroom where our Literacy Research project is working, the children took a field trip to the veterinarian's office. The teacher took video and photographs of the trip and later made a *HyperStudio* stack, complete with children's recorded comments and sound effects, snippets of video footage from the trip, photos, and children's drawings that she had scanned. The stack was available on the hard drive, where students accessed it on many occasions to re-live their visit to the veterinarian. The stacks were printed on a color printer, the pages laminated, bound, and made into a book for the classroom's library center. In another classroom, the teacher drew simple graphics and recorded

her voice reading lines of a nursery rhyme to create a *HyperStudio* stack for a child who was having problems sequencing.

Teachers often take "snapshots" of computer screens and print them to make books, puzzles, and games for their classrooms. In addition, favorite characters from interactive story books have been printed, laminated, and used as finger puppets, play props, art activities, and classroom decorations. Similar screen prints have also been laminated and attached to a child's switch to provide clues for correct switch pressing or added to a nonverbal child's communication board so he can indicate choices.

Art projects have been based on software also. After using *Thinkin' Things* and playing with its Fripple Shop, one group of children made Fripples out of brown paper sacks decorated with paint, yarn, glitter, and other materials. Then they set up their own Fripple Store in the dramatic play area.

The Future of Technology in Education

Technology is education's newest, most exciting and promising tool, and it's not going to disappear! Even those teachers and administrators who were reluctant to jump on the technology bandwagon must now admit that what looked like just another fad on the educational scene 16 years ago is here to stay. Even so, old habits and sacred paradigms are hard to change. Kinnaman (1994) points out technology integration in schools involves more than just "making it fit" into the current system; instead, it requires modifying "the basic structure of America's education." (p. 130)

The American school system paradigm was developed more than a century ago. According to Braun (1993), changing that paradigm to create a technology-based educational paradigm should be done quickly, even if the immediate result is rather chaotic. Changes have to be made on all educational levels: students, teachers, administrators and faculty in teacher education programs must be willing to accept new roles and to work as partners in defining those roles. Colleges and universities must require their complacent professors to integrate technology so that future teachers

will "teach as they were taught"—with technology. Parents and community and business leaders must demand that their elementary and secondary teachers and administrators wake up and realize that waiting to implement a technology plan, or implementing a plan in piecemeal fashion, only cheats their students of valuable learning opportunity. Administrators must act quickly to formulate strategic planning committees and find ways not only to provide their schools with hardware, software, and networking tools but also to provide all staff with technology training, follow-up, and technical support. Finally, teachers must embrace the changes as inevitable and welcome the opportunities they bring to education, for as Joel Barker so eloquently points out in *Discovering the Future*, "Those who say it can't be done should get out of the way of those who are doing it!"

Americans accept the advantages technology offers at home, on the highway, in business and industry. We accept and expect, even demand, these advantages in all aspects of our lives *except education*. Why? Why is it that the educational "we've always done it this way" and "it's worked for over 100 years" attitudes block the integration of technology into our schools where we are educating children for a future that demands they understand and use technology? If America wishes its future generations to be able to meet the demands of a global community, to compete in a world that is technology-based, and to manage the vast amounts of data and information available, we must give today's children the tools they need.

Computers, the Internet, distance learning through satellite links, and other educational technologies are a fact of life. Total reliance on the traditional textbooks, worksheets, and methods of instruction should go the way of slate tablets. Technology has already proven to be an important equalizing tool for children with disabilities; therefore, we can no longer disregard it as an equally important equalizing tool for educating all children. One thing is very clear; it is time for those educators who are comfortable living with the Flintstones to accept the inevitable and "meet George Jetson!"

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